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REMARKS

Claims 1-54 have been examined. Claims 1, 8-9, 46-48, and 51 have been rejected under 35 U.S.C. § 102 (b), and claims 2-7, 10-12, 14, 22-32, 36-45, 49-50 and 52-54 have been rejected under 35 U.S.C. § 103 (a). Also, the Examiner has indicated that claims 13, 15-21 and 33-35 contain allowable subject matter.

I. Preliminary Matters

In the Office Action Summary, page 1, the Examiner has failed to acknowledge the claim to foreign priority and the receipt of the priority documents. Therefore, Applicant requests the Examiner to acknowledge the claim for foreign priority under 35 U.S.C. § 119 in the next Office Action.

During a phone conversation, the Examiner requested that Applicant check the specification and correct any errors found therein. Accordingly, Applicant has reviewed the specification and has corrected a minor error.

In response to the objection of claim 46, the Examiner recommended replacing “of” with “for” to clarify the language in the claim. During Applicant’s review of the claims, Applicant found that claims 49 and 54 contained a similar error. Accordingly, Applicant has amended claims 46, 49 and 54, however, such amendments are not made in response to any prior art rejection and do not narrow the scope of the claims.

II. Rejection under 35 U.S.C. § 102(b) over JP Pat 07137291 to Mikinobu (“Mikinobu”).

Claims 1, 8-9, 46-48 and 51 have been rejected under 35 U.S.C. § 102 (b) as being anticipated by Mikinobu.

A. Claim 1

Applicant submits that claim 1 is patentable over the cited reference. For example, claim 1 recites that a vibrating plate has a piezo-electric element arranged on one side and a cavity forming member arranged on the other side. Liquid in a liquid container comes in contact with the vibrating plate via the cavity forming member.

Mikinobu fails to suggest the above features. As shown in Figure 1, piezo-electric elements 110, 120 are attached to ink storage means 100 by substrate 101 (para. [0014]). A finish plate 150 is attached to the upper sections of piezo-electric elements 110, 120 through an elastic member 140 (Fig. 1; para. [0014]). Even assuming *arguendo* that finish plate 150 corresponds to the claimed vibrating plate, Mikinobu fails to suggest each and every limitation of claim 1. For example, there is no cavity forming member arranged on finish plate 50 on a side opposite of piezo-electric elements 110, 120. Since there is no cavity forming member, ink in ink storage means 100 contacts finish plate 150 on all sides, rather than via a cavity, as recited in claim 1. Therefore, Mikinobu fails to anticipate claim 1.

Accordingly, Applicant submits that claim 1 is patentable and respectfully requests the Examiner to withdraw the rejection.

B. Claims 8 and 9

Since claims 8 and 9 depend on claim 1, Applicant submits that such claims are patentable at least by virtue of their dependency.

C. Claim 46

Since the features of claim 46 are analogous to the features recited in claim 1, Applicant submits that claim 46 is patentable for at least similar reasons as set forth above for claim 1.

D. Claims 47 and 48

Since claims 47 and 48 depend on claim 46, Applicant submits that such claims are patentable at least by virtue of their dependency.

E. Claim 51

Since claim 51 has been canceled, the rejection of such claim is now moot.

III. Rejection under 35 U.S.C. § 103(a) over Mikinobu in view of US Pat 5132711 to Shinada et al. (“Shinada”).

Claims 2-3 and 36 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Mikinobu in view of Shinada. However, since claims 2-3 and 36 depend on claim 1, and Shinada fails to cure the deficient teachings of Mikinobu, Applicant submits that such claims are patentable at least by virtue of their dependency.

IV. Rejection under 35 U.S.C. § 103(a) over Mikinobu in view of JP Pat 10323997 to Fumiyuki (“Fumiyuki”).

Claims 4-5 and 37-41 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Mikinobu in view of Fumiyuki. However, since claims 4, 5 and 37-41 depend on claim 1, and Fumiyuki fails to cure the deficient teachings of Mikinobu, Applicant submits that such claims are patentable at least by virtue of their dependency.

V. Rejection under 35 U.S.C. § 103(a) over Mikinobu in view of US Pat 6347853 to Kato (“Kato”).

Claims 6-7, 11 and 52 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Mikinobu in view of Kato.

A. Claims 6, 7 and 11

Since claims 6-7, 11 depend on claim 1, and Kato fails to cure the deficient teachings of Mikinobu, Applicant submits that such claims are patentable at least by virtue of their dependency.

B. Claim 52

Since claim 52 depends on claim 46, and Kato fails to cure the deficient teachings of Mikinobu, Applicant submits that such claim is patentable at least by virtue of its dependency.

VI. Rejection under 35 U.S.C. § 103(a) over Mikinobu in view of US Pat 6416152 to Matsuzaki et al. (“Matsuzaki”).

Claims 10 and 49-50 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Mikinobu in view of Matsuzaki. However, Matsuzaki and the claimed invention have a common assignee. Applicant submits that the subject matter of Matsuzaki and the claimed invention were subject to a common obligation of assignment pursuant to MPEP 706.02(1)(2). This demonstration of common obligation of assignment removes Matsuzaki as a reference, which in turn, overcomes the 35 U.S.C. §103 rejections of claims 10 and 49-50.

Applicant has enclosed assignment documents for Matsuzaki (Reel 010142, Frame 0666, Date recorded 08/09/1999) and the current Application (Reel 012768, Frame 0824, Date recorded 01/18/2002).

In light of the above, Applicant respectfully requests the Examiner to withdraw the rejection of claims 10 and 49-50.

VII. Rejection under 35 U.S.C. § 103(a) over Mikinobu in view of US Pat 6347853 to Kato and further in view of JP Pat 11010909 to Hirotsugu et al. (“Hirotsugu”).

Claims 12 and 53 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Mikinobu in view of Kato, as applied to claim 11 above, and further in view of Hirotsugu.

A. Claim 12

Since claim 12 depends on claim 1, and Hirotsugu fails to cure the deficient teachings of Mikinobu and Kato, Applicant submits that such claim is patentable at least by virtue of its dependency.

B. Claim 53

Since claim 53 depends on claim 46, and Hirotsugu fails to cure the deficient teachings of Mikinobu and Kato, Applicant submits that such claim is patentable at least by virtue of its dependency.

VIII. Rejection under 35 U.S.C. § 103(a) over Mikinobu in view of Kato, Hirotsugu and in further view of US Pat 5694156 to Hoisington et al. (“Hoisington”).

Claims 14 and 54 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Mikinobu in view of Kato and Hirotsugu, as applied to claims 12 and 53 above, and further in view of Hoisington.

A. Claim 14

Applicant submits that claim 14 is patentable over Mikinobu in view of Kato, Hirotsugu and further in view of Hoisington. For example, claim 14 recites that a shock is given to the ink cartridge during movement of the carriage by the carriage moving step.

The Examiner maintains that the blowing of fuse 37 in Hoisington suggests the shock method. However, fuse 37 is used to reset memory 42 to a number corresponding to full

capacity in the ink reservoir (col. 4, lines 12-15). If fuse 37 is detected, memory 42 is reset, then fuse 37 is blown (col. 4, lines 12-15). The blowing of fuse 37 is not disclosed so as to give a “shock” to the ink cartridge during movement of the carriage, as claimed in claim 14. In addition, Hoisington fails to cure the deficient teachings of Mikinobu.

Accordingly, Applicant has rewritten claim 14 into independent form and submits that such claim is patentable over the cited references. Applicant respectfully requests the Examiner to withdraw the rejection.

B. Claim 54

Applicant submits that claim 54 is patentable over Mikinobu in view of Kato, Hirotsugu and further in view of Hoisington. For example, claim 54 recites that a the ink jet recording apparatus further comprises a shock unit for giving a shock to the ink cartridge during movement of the carriage.

Similar to claim 14 above, the Examiner maintains that the blowing of fuse 37 in Hoisington suggests the shock unit. However, fuse 37 is used to reset memory 42 to a number corresponding to full capacity in the ink reservoir (col. 4, lines 12-15). If fuse 37 is detected, memory 42 is reset, then fuse 37 is blown (col. 4, lines 12-15). The blowing of fuse 37 is not disclosed so as to give a “shock” to the ink cartridge during movement of the carriage, nor can it be considered a “shock unit”, as claimed in claim 54. In addition, Hoisington fails to cure the deficient teachings of Mikinobu.

Accordingly, Applicant has rewritten claim 54 into independent form and submits that such claim is patentable over the cited references. Applicant respectfully requests the Examiner to withdraw the rejection.

IX. Rejection under 35 U.S.C. § 103(a) over Mikinobu in view of Hoisington.

Claims 22-32 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Mikinobu in view of Hoisington. However, since claims 22-32 depend, either directly or indirectly, on claim 1, and Hoisington fails to cure the deficient teachings of Mikinobu, Applicant submits that such claims are patentable at least by virtue of their dependency.

X. Rejection under 35 U.S.C. § 103(a) over Mikinobu in view of Fumiyuki and further in view of Hoisington.

Claims 42 and 43 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Mikinobu in view of Fumiyuki as applied in claim 38 above, and further in view of Hoisington. However, since claims 42 and 43 depend indirectly on claim 1, and Hoisington fails to cure the deficient teachings of Mikinobu, Applicant submits that such claims are patentable at least by virtue of their dependency.

XI. Rejection under 35 U.S.C. § 103(a) over Mikinobu in view of Fumiyuki and US Pat 5835817 to Bullock et al. ("Bullock").

Claim 44 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over Mikinobu in view of Fumiyuki and Bullock. However, since claim 44 depends on claim 1, and Bullock fails to cure the deficient teachings of Mikinobu, Applicant submits that such claim is patentable at least by virtue of its dependency.

XII. Rejection under 35 U.S.C. § 103(a) over Mikinobu in view of Fumiyuki, Bullock and further in view of Hoisington.

Claim 45 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over Mikinobu in view of Fumiyuki and Bullock as applied to claim 44, and further in view of Hoisington. However, since claim 45 depends indirectly on claim 1, and Hoisington fails to cure the deficient teachings of Mikinobu, Applicant submits that such claim is patentable at least by virtue of its dependency.

XIII. Allowable Subject Matter

The Examiner has indicated that claims 13, 15-21 and 33-35 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Therefore, Applicant has rewritten claims 13, 15, 16, 19 and 33 into independent form to incorporate the subject matter of original claim 1.

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Accordingly, Applicant respectfully requests the Examiner to withdraw the claim objections.

XIV. Newly added claims

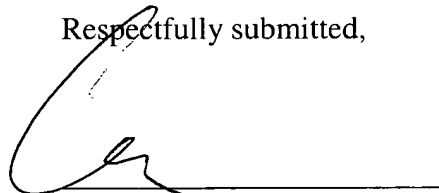
Applicant has added claims 55-63 to more fully define the present invention.

XV. Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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APPENDIX
VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION:

The specification is changed as follows:

Page 12, the second paragraph is amended as follows:

Fig. 2 is a drawing showing an example of ink cartridges for storing a plurality of [kinks]kinds of ink.

IN THE CLAIMS:

Claim 51 is canceled.

The claims are amended as follows:

1. (Amended) An ink consumption condition detection method for detecting an ink consumption condition in an ink container loaded in an ink jet recording apparatus having a recording head for jetting ink drops, wherein said ink consumption condition in said ink container is detected using a piezo-electric device having a piezo-electric element during a non-recording state of said recording head,

wherein said piezo-electric device further has a vibrating plate on one side of which said piezoelectric element is arranged, and a cavity forming member having a cavity which is arranged on the other side of said vibrating plate, and

wherein said vibrating plate can come in contact with said liquid in said liquid container via said cavity.

13. (Amended) An ink consumption condition detection method [according to claim 12]
for detecting an ink consumption condition in an ink container loaded in an ink jet recording
apparatus having a recording head for jetting ink drops,

wherein said ink consumption condition in said ink container is detected using a piezo-
electric device having a piezo-electric element during a non-recording state of said recording
head,

wherein said ink container is an ink cartridge loaded on a carriage for moving said
recording head back and forth in a removable state,

wherein said method comprises:

a consumption condition detection step of detecting, in a non-recording state of said
recording head, said ink consumption condition in said ink cartridge by said piezo-electric
device, and

a reconfirming step of redetecting said ink consumption condition in said ink cartridge by
said piezo-electric device after detection of absence of ink in said ink cartridge by said
consumption condition detection step;

wherein said reconfirmation step comprises:

a carriage moving step of moving said carriage after absence of ink in said ink cartridge
is detected by said consumption condition detection step, and

a consumption condition redetection step of redetecting said ink consumption condition
in said ink cartridge in a predetermined timing;

wherein said carriage moving step moves said carriage at a faster speed than a speed for

moving said carriage during a recording operation.

14. (Amended) An ink consumption condition detection method [according to claim 12]
for detecting an ink consumption condition in an ink container loaded in an ink jet recording
apparatus having a recording head for jetting ink drops,

wherein said ink consumption condition in said ink container is detected using a piezo-
electric device having a piezo-electric element during a non-recording state of said recording
head,

wherein said ink container is an ink cartridge loaded on a carriage for moving said
recording head back and forth in a removable state,

wherein said method comprises:

a consumption condition detection step of detecting, in a non-recording state of said
recording head, said ink consumption condition in said ink cartridge by said piezo-electric
device, and

a reconfirming step of redetecting said ink consumption condition in said ink cartridge by
said piezo-electric device after detection of absence of ink in said ink cartridge by said
consumption condition detection step;

wherein said reconfirmation step comprises:

a carriage moving step of moving said carriage after absence of ink in said ink cartridge
is detected by said consumption condition detection step, and

a consumption condition redetection step of redetecting said ink consumption condition

in said ink cartridge in a predetermined timing;

wherein a shock is given to said ink cartridge during moving said carriage by said carriage moving step.

15. (Amended) An ink consumption condition detection method [according to claim 12] for detecting an ink consumption condition in an ink container loaded in an ink jet recording apparatus having a recording head for jetting ink drops,

wherein said ink consumption condition in said ink container is detected using a piezo-electric device having a piezo-electric element during a non-recording state of said recording head,

wherein said ink container is an ink cartridge loaded on a carriage for moving said recording head back and forth in a removable state,

wherein said method comprises:

a consumption condition detection step of detecting, in a non-recording state of said recording head, said ink consumption condition in said ink cartridge by said piezo-electric device, and

a reconfirming step of redetecting said ink consumption condition in said ink cartridge by said piezo-electric device after detection of absence of ink in said ink cartridge by said consumption condition detection step;

wherein said reconfirmation step comprises:

a carriage moving step of moving said carriage after absence of ink in said ink cartridge

is detected by said consumption condition detection step, and

a consumption condition redetection step of redetecting said ink consumption condition
in said ink cartridge in a predetermined timing;

wherein said consumption condition redetection step is executed when a predetermined time passes after said carriage moving step ends.

16. (Amended) An ink consumption condition detection method [according to claim 12]
for detecting an ink consumption condition in an ink container loaded in an ink jet recording
apparatus having a recording head for jetting ink drops,

wherein said ink consumption condition in said ink container is detected using a piezo-
electric device having a piezo-electric element during a non-recording state of said recording
head,

wherein said ink container is an ink cartridge loaded on a carriage for moving said
recording head back and forth in a removable state,

wherein said method comprises:

a consumption condition detection step of detecting, in a non-recording state of said
recording head, said ink consumption condition in said ink cartridge by said piezo-electric
device, and

a reconfirming step of redetecting said ink consumption condition in said ink cartridge by
said piezo-electric device after detection of absence of ink in said ink cartridge by said
consumption condition detection step;

wherein said reconfirmation step comprises:

a carriage moving step of moving said carriage after absence of ink in said ink cartridge is detected by said consumption condition detection step, and

a consumption condition redetection step of redetecting said ink consumption condition in said ink cartridge in a predetermined timing;

wherein said consumption condition redetection step is executed during moving said carriage by said carriage moving step.

19. (Amended) An ink consumption condition detection method [according to claim 12] for detecting an ink consumption condition in an ink container loaded in an ink jet recording apparatus having a recording head for jetting ink drops,

wherein said ink consumption condition in said ink container is detected using a piezo-electric device having a piezo-electric element during a non-recording state of said recording head,

wherein said ink container is an ink cartridge loaded on a carriage for moving said recording head back and forth in a removable state,

wherein said method comprises:

a consumption condition detection step of detecting, in a non-recording state of said recording head, said ink consumption condition in said ink cartridge by said piezo-electric device, and

a reconfirming step of redetecting said ink consumption condition in said ink cartridge by

said piezo-electric device after detection of absence of ink in said ink cartridge by said consumption condition detection step;

wherein said reconfirmation step comprises:

a carriage moving step of moving said carriage after absence of ink in said ink cartridge is detected by said consumption condition detection step, and

a consumption condition redetection step of redetecting said ink consumption condition in said ink cartridge in a predetermined timing;

wherein said reconfirmation step is executed several times during moving said carriage by said carriage moving step, and presence or absence of ink in said ink cartridge is decided on the basis of detection results of said reconfirmation steps.

33. (Amended) An ink consumption condition detection method [according to claim 1] for detecting an ink consumption condition in an ink container loaded in an ink jet recording apparatus having a recording head for jetting ink drops, wherein said ink consumption condition in said ink container is detected using a piezo-electric device having a piezo-electric element during a non-recording state of said recording head,

wherein said piezo-electric device has a vibration part including said piezo-electric element, and

wherein said piezo-electric device measures a periodic peak value of a waveform of counter electromotive force generated by residual vibration remaining in said vibration part by a predetermined number of said periodic peak values from a predetermined point of time, and said

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piezo-electric device measures more number of said periodic peak values than said predetermined number of said periodic peak values in subsequent detection of said ink consumption condition, and thereby detects said ink consumption condition.

46. (Amended) An ink jet recording apparatus comprising:
a recording head [of jetting] configured to jet ink drops;
an ink cartridge [of feeding] configured to feed ink to said recording head;
a piezo-electric device [of detecting] having a piezo-electric element configured to detect an ink consumption condition in said ink cartridge, said piezo-electric device further having a vibrating plate on one side of which said piezo-electric element is arranged, and a cavity forming member having a cavity which is arranged on the other side of said vibrating plate, said vibrating plate being able to come in contact with said liquid in said liquid container via said cavity; and
a control unit [of]for controlling said piezo-electric device so as to detect said ink consumption condition when said recording head is in a non-recording state.

49. (Once Amended) An ink jet recording apparatus according to claim 46, further comprising a storage unit [of]for storing said ink consumption condition in said ink cartridge which is detected by said piezo-electric device.

54. (Amended) An ink jet recording apparatus [according to claim 53] comprising:
a recording head configured to jet ink drops;

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an ink cartridge configured to feed ink to said recording head;
a piezo-electric device detecting an ink consumption condition in said ink cartridge;
a control unit of controlling said piezo-electric device so as to detect said ink
consumption condition when said recording head is in a non-recording state; and
a carriage moving with said recording head and said ink cartridge both of which are
loaded on said carriage,
wherein said control unit controls said piezo-electric device so as to redetect said ink
consumption condition in said ink cartridge after said piezo-electric device detects absence of ink
in said ink cartridge when said recording head is in a non-recording state, and
wherein said control unit moves said carriage after detection of absence of ink in said ink
cartridge by said piezo-electric device and controls said piezo-electric device so as to redetect
said ink consumption condition in said ink cartridge in a predetermined timing,
said apparatus further comprising a shock unit [of giving]configured to give a shock to
said ink cartridge during movement of said carriage.

Claims 55-63 are added as new claims.